Multinomial-Processing-Tree Modeling: Basic Methods and Recent Advances

(Edgar Erdfelder, Daniel W. Heck, Franziska Meissner)

Workshop Day 1: Essentials of MPT Modeling (Saturday, September 15th, 13:00-19:00)

- 13:00 – 13:30: Introduction & Overview
- 13:30 – 14:45: Basics (Instructor: EE)
  - Introduction to standard MPT models (logic, examples, advantages, limitations)
  - Model development (model construction, paradigm, data structure, identifiability)
  - Parameter estimation (maximum likelihood, minimum χ^2, power-divergence statistics)
  - Model assessment (G^2, Pearson's χ^2, and the PD^{λ} family of goodness-of-fit statistics)
- *Break*
- 15:00 – 16:30: Application I (Instructor: EE)
  - Introduction to multiTree: EQN syntax, data files, batch analysis
  - Practical exercises
  - Order constraints
- *Break*
- 16:45 – 17:45: Substantive research questions and psychological theory (Instructor: FM)
  - Multinomial modeling of the implicit association test (IAT)
  - Model validation: Testing selective influence
  - Different models for different research questions
- *Break*
- 18:00 – 19:00: Application II (Instructor: FM, EE, & DH)
  - Workflow with multiTree: Developing and testing a new MPT model
  - Optional: Testing interactions (EE)

Workshop Day 2: Advances in MPT Modeling (Sunday, September 16th, 9:00-18:00)

- 9:00 – 9:45: Advanced features of multiTree (Instructor: EE)
  - Identifiability concepts and checks provided by multiTree
  - A priori and post hoc statistical power analyses
  - Model selection (AIC, BIC, NML, and FIA criterion)
- 09:45 – 10:30: Application III (Instructor: EE, FM, & DH)
  - Using advanced features in multiTree
  - Application to an empirical example
- *Break*
- 10:45 – 12:00: Bayesian hierarchical MPT modeling (Instructor: DH)
  - MPT models & heterogeneity
  - Hierarchical MPT models
  - Bayesian estimation with MCMC sampling
  - Adding external covariates
- *Noon Break*

- 13:00 – 14:30: Application IV (Instructor: DH)
    - Practical exercises on hierarchical MPT modeling using TreeBUGS
    - Basics: Model fitting, convergence, plots, model fit
    - Advanced: Within-/between-subject comparisons, covariates, simulation
- *Break*
- 14:45 – 15:45: Modeling continuous data with discrete bins (Instructor: DH)
    - Modeling response times with histograms (MPT-RT)
    - Short illustration: The MPT-RT approach in practice
- *Break*
- 16:00 – 17:00: Mixture models for continuous data (Instructor: DH)
    - Parametric modeling with generalized processing trees (GPT)
    - Serial process model for response times (RT-MPT)
    - Short illustration: The R package “gpt” for GPT models
- *Break*
- 17:15 - 18:00: Application V (Instructors: DH, EE, & FM)
    - Questions and answers
    - Developing and testing (new) models suggested by the participants